Phase II Air Monitoring Summary Report for Seattle Iron and Metals Corporation (SIM)

by

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March 1, 2022

HIGHLIGHTS - INITIAL RESULTS

$PM_{2.5}$

Phase II data from the Seattle Iron & Metals Corporation facility (SIM's facility) for **$PM_{2.5}$ collected during the "dry" season** (June to September 2020) are substantially greater than the levels measured during Phase I (background).

- The Phase II (SIM's facility) data for 1-hour values during the dry season ranged from 22.2 to 30.4 ug/m^3
- The Phase I (background) data for 1-hour values during the dry season ranged from 5.8 to 6.8 ug/m^3
- For Phase II (SIM's facility), the highest observations were measured at the southern end of the wall on the 701 Property (Site 5).

Phase II data (SIM's facility) for **$PM_{2.5}$ collected during the "wet" season** (September 2020 to January 2021) are substantially lower as follows:

- The Phase II (SIM's facility) data for 1-hour values during the wet season range from 6.4 to 10.5 ug/m^3.
- There are no comparable Phase I (background) data for 1-hour values during the wet season since that data was collected during just the dry season.

Phase II data (SIM's facility) for $PM_{2.5}$ collected during the **balance of the sampling period** (January 2021 through June 2021) are substantially lower as follows:

- The Phase II (SIM's facility) data for 1-hour values during this period range from 4.4 to 6.3 ug/m^3.
- While there are no comparable Phase I (background) data for 1-hour values during the exact same time period, these data are in the range of the from 5.8 to 6.8 ug/m^3 measured during the May – August 2019 period.

Lead

Phase II data (SIM's facility) for **lead** have measured lower than the National Ambient Air Quality Standards (NAAQS) 3-month average lead standard of 0.15 ug/m^3. The Phase II (SIM's facility) lead data collected so far (in 3-month averages) are 0.01908 ug/m^3 (June – Sept, 2020), 0.0111 ug/m^3 (Sept 2020 – Jan 2021), 0.04462 ug/m^3 (Jan – Apr 2021) and 0.08116 ug/m^3 (Apr

– Jun 2021). Note that NAAQs are not directly applicable screening levels for this data as described in the Data Summary of this report.

BACKGROUND & CONTEXT

Seattle Iron & Metals Corporation (SIM) is a metal shredding and recycling facility located in Seattle's Georgetown neighborhood on the eastern shore of the Duwamish River. Puget Soundkeeper Alliance filed a lawsuit against SIM in 2012 to enforce the federal Clean Water Act and Resource Conservation and Recovery Act. The parties resolved that lawsuit via a consent decree in federal court finalized in early 2019 and amended in late 2020.

As part of that consent decree (Consent Decree No. 12-01201RSM), T&B Systems conducted Phase II air monitoring at the SIM facility in Seattle, Washington. **This report details efforts for the Phase II monitoring from September 15, 2020 through June 15, 2021. An interim Phase II report prepared previously in September 2021 covered the time period from September 15, 2020 through January 18, 2021**. This report also includes a summary of the results for all of the Phase II work beginning June 2020 through June 2021 and the prior Phases of this work as described below. The Phase II work concluded in mid-June 2021. This constitutes the final Phase II report, including comparisons to prior results in Phase I.

STUDY GOALS

The goal of this Phase II work is to measure the levels of certain airborne pollutants present at SIM's fence line. To that end, data was collected at 5 locations at the SIM facility. Data from Phase II will be compared to data collected at the same locations in the Phase III study (expected in 2024) after SIM's structural emissions controls have been installed.

STUDY DESIGN

The industrial activities that occur at SIM have the potential to entrain, aerialize and emit various pollutants to air. The pollutants sampled and analyzed in this study were selected due to their correlation to SIM's industrial activities.

In 2018, two fence line monitoring systems were installed at the SIM facility. Those monitors measured the levels of particulate matter present at the site. This effort is now called Base Case.

Then, in 2019, Phase I of the study commenced with 10 weeks of "background" dust monitoring designed to measure levels of air pollution present in the surrounding neighborhoods. Phase I was designed to collect samples at locations that were not impacted by SIM's operations. Samples were collected at three offsite monitoring locations capable of monitoring total suspended particulate (TSP) and particulate matter (PM) of 2.5 micrometers (µm) or less (referred to as $PM_{2.5}$) on a continuous basis. The collected TSP at each station was also analyzed for metals. Additionally, each station was equipped with a pump and sampling media for the collection and analysis of polychlorinated biphenyl (PCB) and dioxin samples for subsequent analysis using high-resolution analytical methods. These results were reported in T&B Systems' April 2020 Phase 1: Background Air Monitoring Summary for Seattle Iron and Metals Corporation, available here: http://www.seairon.com/environmental-documents-.

Phase II of the dust monitoring program began in June 2020, consisting of 1 year of continuous dust monitoring at two locations at the SIM 601 Facility (the original Site 1 and Site 2 sampling locations from the 2018 monitoring effort (Base Case)) and at three additional sampling locations at the north, east, and south fence lines of the 701 Facility (Site 3, Site 4 and Site 5 respectively) (see **Figure 1**). Coordinates for each of the sampling site locations are presented in **Table 1**.

METHODOLOGY

Table 2 lists the equipment used for the monitoring effort. The core measurements of the study were continuous measurements of TSP and $PM_{2.5}$ concentrations, continuous meteorology at one of the sites and sample media used to collect PCB and dioxin compounds. Thermo Personal Data Ram (pDR) Model 1500 samplers were used for all TSP and $PM_{2.5}$ measurements including the collection of metals on the TSP pDR Teflon sample filters and SKC pumps were used with PUF media for the collection of PCB and dioxin compounds. Beginning January 21, 2021, new Met One ES642 TSP and $PM_{2.5}$ aerosol samplers were installed in place of the rental Thermo pDR samplers. Performance specifications of the particulate matter measuring equipment are presented in **Table 3**.

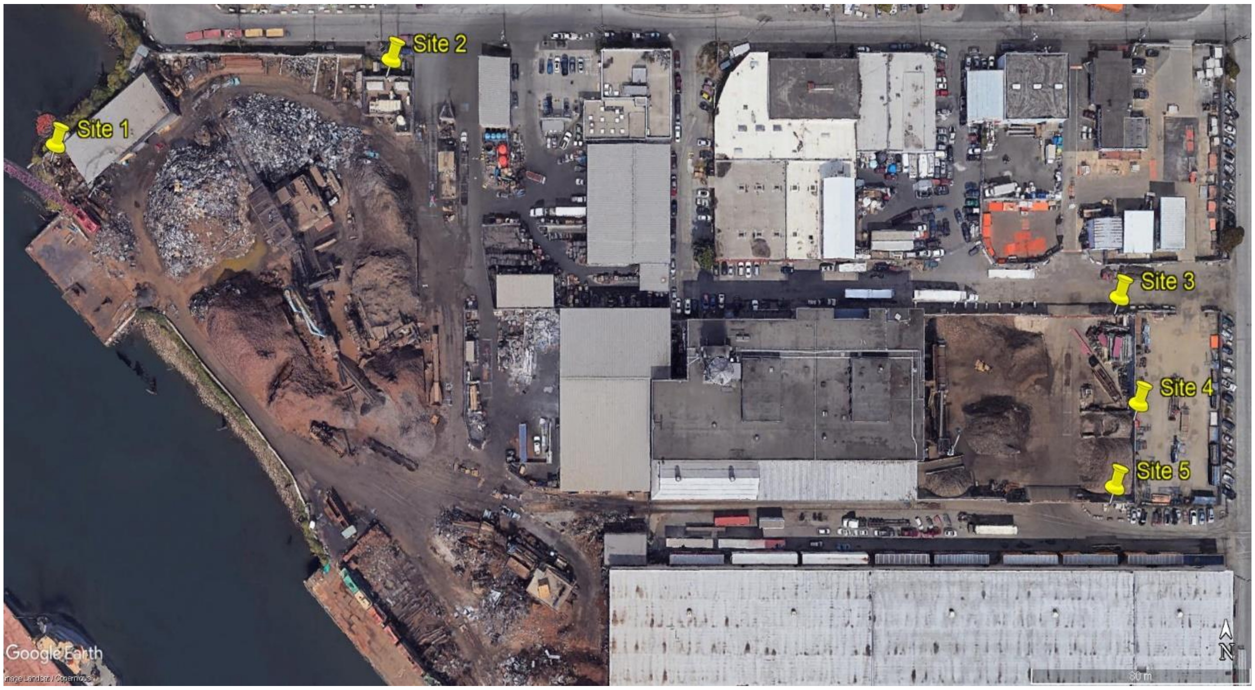

Figure 1. Phase II Monitoring Locations (yellow push pins)

Site 1 is located close to the water at the very left of the photograph in Figure 1. The meteorological data collection is located at Site 1. Site 2 is located along the northern boundary of the facility and close to the shredder. Sites 1 and 2 are located in the 601 Facility. Sites 3, 4, and 5 are located in the eastern edge of the 701 Facility, with Site 3 in the north, Site 4 in the middle, and Site 5 in the south, as seen in Figure 1. The coordinates for the Sites are shown in Table 1 below.

Table 1. Site Coordinates

Site 1 (601 Facility, Western)	47.539036° -122.328148°
Site 2 (601 Facility, Northern)	47.539261° -122.326561°
Site 3 (701 Facility, Northern)	47.538598° -122.323208°
Site 4 (701 Facility, Center)	47.538350° -122.323130°
Site 5 (701 Facility, Southern)	47.538076° -122.323191°

Table 2 shows details of the instruments used to conduct the various measurements. The first three rows (Items (1)-(3)) show the meteorological measurements such as wind speed and direction, ambient temperature, relative humidity and precipitation. As noted previously, all of these are located at Site 1. Items (4)-(7) show the instruments and details for pollutant measurements, including total suspended particulate matter (TSP), fine particulate matter ($PM_{2.5}$), PCBs and dioxins, and metals. These were monitored at each of the five sample collection Sites. Finally, Items (8) and (9) show the data recording and telemetry (i.e., data transmittal) instruments at each of the five sample collection Sites.

Table 2 – Instrumentation Details

Measurement	Site(s)	Make/Model	Sampling	Comments
(1) Wind Speed and Direction	Site 1	RM Young Wind Monitor	1-s scans (not recorded but used in the calculations), 5-min, hourly, 24-hour averages, vector and scalar wind calculations	Sensor was located on a tripod with a height of about 4 meters.
(2) Ambient Temperature/Relative Humidity	Site 1	RM Young 41382VC	1-s scans (not recorded but used in the calculations), 5-min, hourly, 24-hour averages	Sensors were housed in a radiation shield located on a tripod at a height of about 2 meters.
(3) Precipitation	Site 1	Texas Electronics TR-525M	1-s scans (not recorded but used in the calculations), 5-min, hourly, 24-hour totals	Sensor was located on a tripod at a height of about 2 meters.
(4) PM (TSP)	Sites 1 - 5	Thermo pDR-1500 with TSP cyclone Met One ES642 with TSP cyclone (Installed 1/20/21)	1-s scans (not recorded but used in the calculations), 5-min, hourly, 24-hour concentrations	Sample inlet height of about 2 meters. Nominal sample flow of 2.0 lpm (pDR) Met One ES642 nominal flow of 2.0 lpm
(5) PM ($PM_{2.5}$)	Sites 1 - 5	Thermo pDR-1500 with $PM_{2.5}$ cyclone Met One ES642 with $PM_{2.5}$ cyclone (Installed 1/20/21)	1-s scans (not recorded but used in the calculations), 5-min, hourly, 24-hour concentrations	Sample inlet height of about 2 meters. Nominal sample flow of 1.5 lpm (pDR) Met One ES642 nominal flow of 2.0 lpm

(6) PCB/Dioxins	Sites 1 - 5	SKC Personal Sample Pump with PUF sample media Customized flowrate metered system installed on 1/20/21	PUF samples were collected monthly in the wet season and weekly in the dry season and analyzed by ALS /Global	Sample inlet height of about 2 meters. Nominal sample flow of 1.0 lpm PCBs analyzed using USEPA Method 1668 and dioxins using USEPA Method 8290A
(7) Metals	Sites 1 - 5	TSP pDR-1500 Teflon sample filters Teflon filter holders with Teflon filters used starting 1/20/21	Sample filters collected PM over the entire study period and analyzed by CHESTER LabNet	Metals analyzed using X-Ray Fluorescence EPA-IO-3.3
(8) Data recording	Sites 1 - 5	Campbell Scientific CR1000 and CR300	1-s scans and 5-min, hourly and 24-hour averages/totals	
(9) Cellular telemetry	Sites 1 - 5	Sierra Wireless AirLink Raven XT and Campbell Scientific CELL210		

Since the particulate matter (TSP and $PM_{2.5}$) measurements are of interest, the pDR instrument used is described in Table 3 below.

Table 3 – pDR 1500 Specifications

Concentration measurement range (auto-ranging)	0.001 to 400 mg/m^3
Scattering coefficient range	1.5 x 10-6 to 0.6 m-1 (approx.) @ λ = 880 nm
Precision/repeatability over 30 days (2-sigma)	± 2% of reading or ± 0.005 mg/m^3, whichever is larger, for 1- second averaging time ± 0.5% of reading or ± 0.0015 mg/m^3, whichever is larger, for 10-second averaging time ± 0.2% of reading or ± 0.0005 mg/m^3, whichever is
Accuracy	± 5% of reading (± precision) traceable to SAE Fine
Resolution	0.1 µg/m^3
Particle size range of maximum Response	Total Suspended Particulate

The pDR sampler uses an optical method to detect particles, providing a continuous measurement of TSP and $PM_{2.5}$ concentrations. While the sampler does not have EPA Federal Reference Method (FRM) or Federal Equivalent Method (FEM) status for the measurement of TSP and $PM_{2.5}$, studies have shown that readings from the pDR correlate very well with those from FEM or FRM instrumentation, and therefore provide an economical means of measuring TSP and $PM_{2.5}$ concentrations for this type of application.[1]

Met One ES642 specifications

Concentration measurement range (auto-ranging)	0 to 100 mg/m^3
Accuracy	± 5% traceable standard with 0.6 um PSL
Resolution	0.1 μg/m^3
Particle size	Total Suspended Particulate and $PM_{2.5}$ (using sharp cut cyclone inlet)

The ES-642 sampler uses an optical method to detect particles, providing a continuous measurement of TSP and $PM_{2.5}$ concentrations. While the sampler does not have EPA Federal Reference Method (FRM) or Federal Equivalent Method (FEM) status for the measurement of TSP and $PM_{2.5}$, studies have shown that readings from the ES-642 correlate very well with those from FEM or FRM instrumentation, and therefore provide an economical means of measuring TSP and $PM_{2.5}$ concentrations for this type of application.

Data was collected using both instruments above for an overlapping period of one month in order to confirm consistency.

SUMMARY OF FIELD OPERATIONS

For Phase II, Sites 1 and 2 were installed on June 17, 2020 and Sites 3, 4, and 5 were installed on June 18, 2020, with continuous PM and meteorological measurements (at Site 1 only) beginning on these dates. The PCB and dioxin monitoring commenced at Sites 1, 4 & 5 on June 18, 2020 and at Sites 2 and 3 on June 19, 2020. All sampling concluded on or about June 15, 2021.

Due to performance issues observed with the Thermo pDR samplers, Met One ES642 samplers were installed in place of the Thermo pDR monitors on January 20, 2021 and were used for the remainder of the monitoring during Phase II. Prior to switch to the ES642 monitors, a colocation between the Thermo pDR and Met One ES642 monitors was performed to ensure that the data collected from the Met One ES642 monitors were consistent with the data collected from the Thermo pDR monitors. The colocation results are available in the Dust Monitoring Plan: Phase II Addendum dated April 2021

Each Site location was selected based on multiple criteria including its ability to measure potential pollutants that might leave the Site based on activities and emission sources on the Site. Sites 1 and 2 are located in the 601 Facility where the shredder is located along with initial processing of the scrap. Site 1 provides data on emissions potentially leaving the facility and affecting the

[1] https://www.mdpi.com/1424-8220/20/23/6819/pdf

Duwamish River or from external emissions coming onto the facility from other areas (offsite sources) depending on wind direction. Site 2, located along a wall adjacent to Myrtle Avenue, provides data on emissions that may potentially leave the Site to the north, including shredder emissions. Sites 3-4 are located along the 701 Facility along the boundary wall and provide data on emissions that may be associated with auto shredder fluff and non-ferrous metals recovery operations at that location, which may potentially leave that Site to the north, the west, and south, respectively. Additional details of each Site are described in the paragraphs below.

Site 1 is installed on a landing at the northwest corner of the SIM 601 Facility, and is powered by AC power using an extension cord with a battery backup. The pDRs and SKC pumps are housed in the CR1000 datalogger enclosure that was attached to the meteorological tripod. The Wind Monitor sensor orientation has been verified with a GPS and oriented to true North. The PM sample inlets are attached to the mast with the inlet located about 1.5 meters under the Wind Monitor. Funnels are attached to prevent rain water from entering the sample lines. **Figure 2** shows the installed system at Site 1. The Site 1 location is the same as in the 2018 Base Case work.

Site 2 is installed at the northern fence line of the SIM 601 Facility on the facility's concrete fence. The pDRs and SKC pumps are housed within the CR300 datalogger enclosure, which is placed on top of a work bench with the PM sample inlets installed approximately 6 meters above the ground at the top of the concrete fence. The site is powered by AC power onsite with a battery backup. Funnels are attached to prevent rain water from entering the sample lines**. Figure 3** shows the installed system at Site 2. The Site 2 location is the same as in the 2018 Base Case work.

Site 3, a new location for Phase II, is installed at the northern fence line of the SIM 701 Facility on the facility's concrete fence, near the intersection of the facilities northern and eastern fence line. The pDRs and SKC pumps are housed within the CR300 datalogger enclosure which is secured on a rail on the top of the fence. The PM sample inlets, located at the top of the enclosure box, are therefore 6 meters above ground level. The site is powered by AC power using an extension cord with a battery backup. Funnels are attached to prevent rain water from entering the sample lines**. Figure 4** shows the installed system at the Site 3.

Site 4, a new location for Phase II, is installed at the eastern fence line of the SIM 701 Facility on the facility's concrete fence, midway between the facility's norther and southern fence line. The pDRs and SKC pumps are installed within the CR300 datalogger enclosure which is secured on a bracket on the top of the fence. The PM sample inlets, located at the top of the enclosure box, are therefore 6 meters above ground level. The site is powered by AC power using an extension cord with a battery backup. Funnels are attached to prevent rain water from entering the sample lines**.** **Figure 5** shows the installed system at the Site 4.

Finally, Site 5, a new location for Phase II, was installed at the southern fence line of the SIM 701 Facility on the facility's concrete fence, near the intersection of the facilities southern and eastern fence line. The pDRs are housed within the CR300 datalogger enclosure which is secured on a bracket on the top of the fence. The PM sample inlets, located at the top of the enclosure box, are therefore 6 meters above ground level. The site is powered by AC power using an extension cord with a battery backup. Funnels are attached to prevent rain water from entering the sample lines. **Figure 6** shows the installed system at the Site 5.

Quality Control and Data Validation

It is customary to conduct quality assurance and data validation for any data that is collected in the field in order to ensure that it is valid. That is a pre-requisite before the data is then analyzed and from which any valid conclusions can be drawn. This section described the quality control and validation efforts, which are standard practice for such field data collection campaigns.

Periodic checks (weekly except for monthly in the wet season) of the sampling systems were conducted by consultants to SIM. These checks included the following:

- Visual check that nothing had changed at the site, including instrument conditions
- Flow check of the pDR and SKC samplers, to ensure that proper ambient air flow was maintained in these instruments. Routine flow checks were performed of the Met One ES642 samplers following installation on January 20, 2021
- Weekly pDR Zero checks in the dry season and monthly Zero checks during the wet season of the pDR response in order to ensure that there was no "drift" in the zero response (i.e., that the instrument was reading zero when there was no air flow). Manual Zero check verifications of the Met One ES642 samplers were not required as the sampler has auto-zeroing capability for maintaining the proper zero setting

Over the period of the study, as is normal, some of the instruments exhibited increased zero baseline responses (i.e., were reading values other than zero when they should have been zero), which was tracked by the routine zero checks. Additionally, several of the pDR and SKC pump sample flow rates needed to be adjusted due to slight variations in the flows through these instruments. All adjustments were documented on log sheets by SIM consultants. Details of these adjustments are available if needed. These types of zero and flow variations are common in field measurements.

In addition to the instrument zero and flowrate drifts noted above, SIM consultants periodically reset the pDR at the sites as communications from the pDR to the datalogger would occasionally fail. Additionally, some of the rental pDR units experienced malfunctions that could not be addressed/repaired in the field and needed to be exchanged with different rental pDR units. As noted, the Thermo pDR samplers were replaced with new Met One ES642 samplers on January

20, 2021, which significantly reduced instrumentation issues and loss of data. While there was some loss of data as a result of using the pDR samplers, it did not affect the substantial amounts of data that were collected and from which conclusions can be drawn. Again, while it is always an objective to have 100% collection of all data, that is never possible, especially for monitoring campaigns, such as this effort, where instruments (along with their power and telemetry needs) are located for very long periods of time in outdoor conditions.

All data from the Sites were uploaded via cellular modem to T&B's Vista Data Vision web-based data management system, where they were reviewed on at least a once-daily basis for instrument related problems, as well as any other issues that could influence the achievement of the study goals. In addition, alarm notifications were used to push email and text alert notifications if any problems were detected.

Early in the monitoring effort, it was determined that the repeated adjustments of the zero drift of the samplers (effectively changing the offset applied by the instrument) during the weekly zero checks was potentially resulting in the underreporting of data. It was decided that rather than physically changing the offset in the instrument, the data would be adjusted for any drift in the zero response, based on the zero check data, during post-processing of the data. Zero offsets greater than or equal to 5 $\mu g/m^3$ were linearly interpolated between zero checks and subtracted from reported concentration. Data reported in this Phase II report are appropriately adjusted.

Also noted during ongoing review of the data, were instances where TSP concentrations were less than associated $PM_{2.5}$ concentrations, implying differences in response between the samplers, which is not unexpected. While TSP concentrations should be equal to or greater than $PM_{2.5}$ concentrations, the manner in which these size fractions are detected (i.e., the instrument response) can cause errors especially when most of the particles are of very fine size. It should be noted that instruments are measuring particles that are not uniform in chemical composition and are not geometrically uniform and spherical. Wildfire smoke in the Seattle area (from September 9 to September 19, 2020) impacted some of the dry weather data collected towards the end of this sampling period, producing long periods of high PM concentrations that likely masked any local sources including SIM. Data measured during periods impacted by wildfire were not included in the analysis. However, these periods also provided a means of investigating the response differences between the samplers, using the reasonable assumption that these regional smoky periods were defined by basically homogenous and fine particulate concentrations over the entire SIM facility at levels that effectively overwhelmed any contributions from local sources. The period of wildfires allowed instrument responses to be checked.

Figure 2. Site 1 Monitoring System

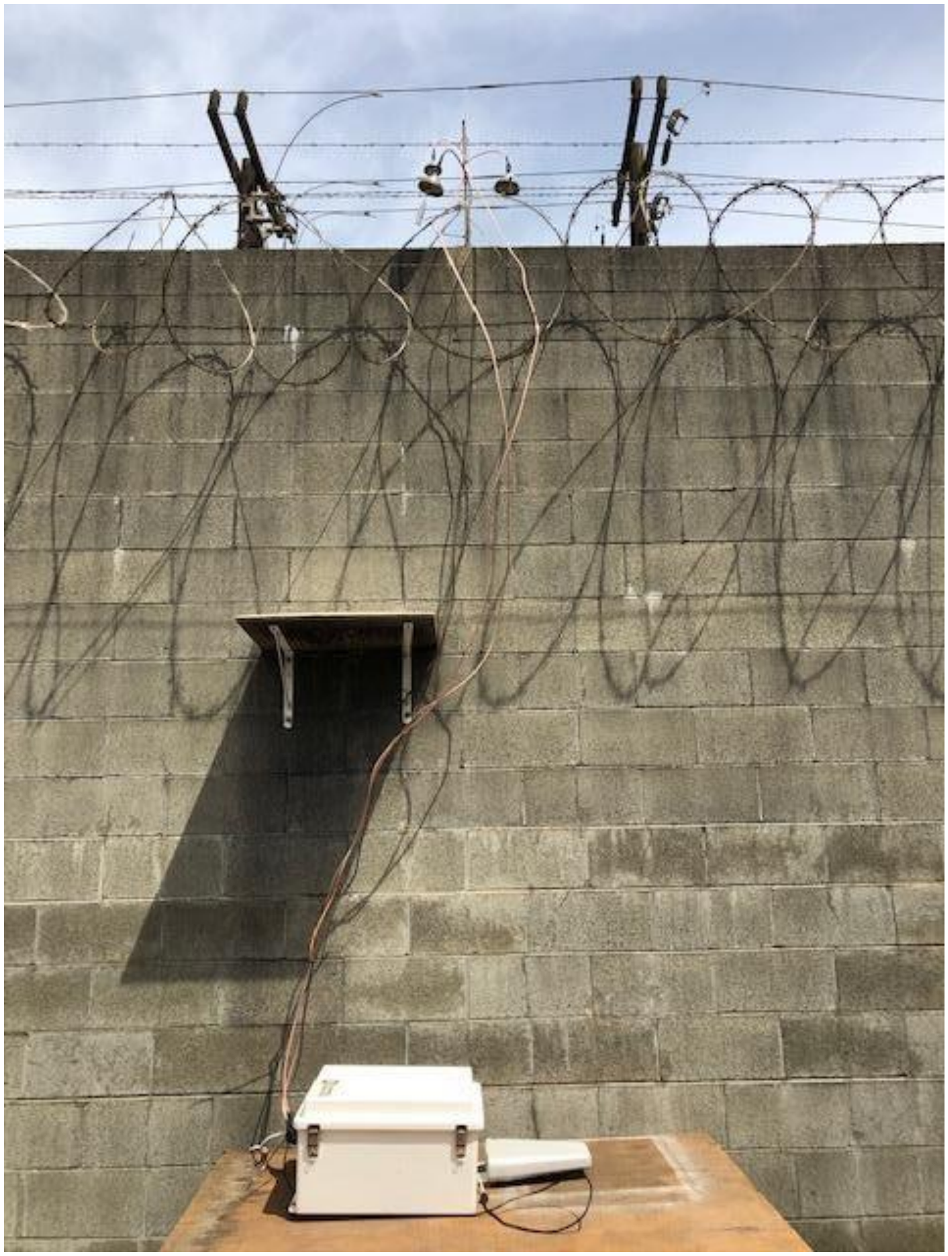

Figure 3. Site 2 Monitoring System

Figure 4. Site 3 Monitoring System

Figure 5. Site 4 Monitoring System

Figure 6. Site 5 Monitoring System

DATA SUMMARY

A brief summary of the data collected in Phase II is provided in this section. While some interpretation of the data is provided, it is appropriate to defer a more complete interpretation till the post-control Phase III data are collected. While interpreting the data, the objectives of the data collection should be kept in mind. The overall goal of this work, along with the prior Phase I background (2019) and earlier Base Case (2018) data collection was to determine the extent to which emissions of various pollutants may be leaving the SIM facility under its current (i.e., prior to additional controls that are in the process of being installed) conditions. Phase III, which will be implemented after these controls are in place, will provide a set of post-control data.

Data comparison to prior work (i.e., Phase I and Base Case) is limited by the pollutants that were measured or not in these prior rounds as the program scope has evolved. For example, while particulate matter data (TSP and $PM_{2.5}$) were collected in prior phases and PCB/dioxin and metals data were also collected during Phase I, these were not collected during the Base Case. The monitoring objectives of the 2018 Base Case were to measure particulate matter concentrations (TSP only) to determine facility (and outside sources) contributions/impacts of PM at the facility fenceline.

Finally, while relative comparisons of the data (i.e., Phase II versus Phase I or Base Case, etc.) are possible where data are available, drawing conclusions on the absolute values of the data, such as by comparing to standards (where available) are also possible in a few but not all instances. For example, there are National Ambient Air Quality Standards (NAAQS)[2] for several pollutants such as $PM_{2.5}$ and lead. It should be noted, however, that NAAQS consist not only of a numerical value but also an averaging time as well as a statistical form. Thus, comparisons with NAAQS should be done carefully. Considering $PM_{2.5}$ alone, there are three NAAQS: a primary annual standard of 12 ug/m^3; a secondary annual standard of 15 ug/m^3; and a primary/secondary 24-hour average standard of 35 ug/m^3. While the data collected to date has spanned a complete year, the most appropriate of these absolute comparisons is to the 24-hour NAAQS of 35 ug/m,^{3} even for this comparison, however, a proper determination of whether this NAAQS is being exceeded would require comparing the 98th percentile of these 24-hour values for each year, average over 3 years – which cannot be done with the data available since three years' of data has not been collected. The NAAQS for lead is 0.15 ug/m^3, on a rolling 3-month average basis.

Comparisons to measured pollutant levels for which there are no NAAQS should be done on a relative basis, including after the Phase III post-control data collection. While various states and several jurisdictions may have levels for these pollutants (such as the non-lead metals, PCBs/dioxins), they are usually derived from risk-based considerations and any comparisons for these pollutants should be done in a risk assessment context, which is currently not part of the scope of this data collection effort.

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[2] https://www.epa.gov/criteria-air-pollutants/naaqs-table

The following data are presented in this Report:

Table 4 summarizes all of the 1-hour TSP data as well as the 1-hour $PM_{2.5}$ data collected during Phase II as well as during the prior Base Case and Phase I campaigns. I have summarized the results for 1-hour TSP and $PM_{2.5}$ because these hourly values provide much more granular data showing the variability of the data set as opposed to averages such as 24-hours, etc. Any averaging will, of course, smooth out the data – i.e., the maximum 24-hour average of the data will be numerically smaller than the maximum 1-hour average, etc.

The Phase II data are presented in three segments (through September 2020, between September 2020 and January 2021 and then the balance of the data from January through the end in mid-June 2021). This facilitates a comparison between the generally "dry" season data (i.e., collected over the summer – i.e., through mid-September 2020 – when ambient rainfall levels are typically low, leading to dry conditions that are more conducive to particulate emissions and suspension/dispersion of such emissions in the atmosphere) and "wet" season data through January 2021. It should be noted that data prior to September 19, 2020 were affected by regional wildfires. Table 4 also contains the calculated fraction of the TSP that was $PM_{2.5}$ using the maximum, average, and median values of the data presented. Table 4 is provided in an Excel spreadsheet. All data are available on the project website previously noted.

The summary of the 1-hour $PM_{2.5}$ data is provided below in Table 4A for illustration and discussion purposes. As noted earlier, data impacted during wildfires were not included.

Table 4A – Summary of Average 1-hour $PM_{2.5}$ Results for Various Sites/Time Periods

Phase/Site	**Average 1-hour $PM_{2.5}$ (ug/m^3)**		
Phase I (Background)	5/9/19 – 8/29/19		
City	6.8		
Heiser	5.9		
Residential	5.8		
Phase II	6/18/20 – 9/15/20	9/16/20 – 1/19/21	1/20/21 – 6/15/21
…Site 1	26.3	8.9	4.9
Site 2	23.1	10.5	6.3
…Site 3	23.4	8.6	4.4
…Site 4	22.2	6.4	4.4
…Site 5	30.4	7.4	4.8

I first note that $PM_{2.5}$ data was not collected in the Base Case and therefore no Base Case data are shown in Table 4A above. Several conclusions can be drawn from the data, as follows:

(i) the background data, collected in Phase I at the three sites are relatively consistent and range from average 1-hour values of 5.8 to 6.8 ug/m[3];

(ii) Phase II data from the Site, at all locations, during the “dry” season are substantially greater than the Phase I data and the average 1-hour values range from 22.2 to 30.4 ug/m,[3] with the highest observations in Site 5 located at the southern end of the wall in the 701 Property;

(iii) Phase II data, from the Site during the “wet” season (i.e., September 2020 through mid-January 2021), however, are substantially lower and the 1-hour average values range from 6.4 to 10.5 ug/m[3];

(iv) Phase II data from mid-January 2021 through the end in mid-June 2021 were also substantially lower than the “dry” season data and the 1-hour average values range from 4.4 to 6.3 ug/m;[3]

(iv) A proper NAAQS evaluation of the data collected to date cannot be conducted since that would require at least three years of data to be collected. However, I note that roughly 1 year average $PM_{2.5}$ concentration of all sample locations was approximately 12.8 ug/m,[3] which is only slightly greater than the annual NAAQS of 12 ug/m,[3] driven by the “dry” season data.

Table 5 presents the results for Dioxin/Furans below for the first two quarters of the Phase II campaign. Please note that the data are “J” qualified and these include the mass and the concentrations estimated as well.[3]

Table 5 – Dioxin/Furan Data

Sample Location	Sample Identification	Sample Date Range		Dioxin/Furan TEQ Mass[1,2] (picograms)	Total Air Volume through PUF Filter (liters)	Dioxin/Furan TEQ Concentration (picograms/liter)
		Start Date	End Date			
SITE 1	SITE 1 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	11.14 J	593,076	0.000018783
SITE 2	SITE 2 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	5.55 J	541,517	0.000010249
SITE 3	SITE 3 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	12.7 J	611,535	0.000020767
SITE 4	SITE 4 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	3.36 J	649,041	0.000005177
SITE 5	SITE 5 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	16.71 J	698,541	0.000023921

NOTES:

[1] Air dust composite samples collected using polyurethane foam (PUF) sorbent cartridges. PUF samples analyzed for dioxins and furans by U.S. Environmental Protection Agency Method TO-9A.

[2] Total dioxin/furan concentrations derived using the total toxicity equivalency method in Section 708(8) of Chapter 173-340 of the Washington Administrative Code. Concentrations reported at less than the laboratory reporting limit were treated as zero (0) values in the TEQ calculation.

J = result is an estimate

TEQ = toxic equivalent concentration

Table 6 presents the results for PCBs below for the first two quarters of the Phase II campaign. Please note that the data are “J” qualified and these include the mass and the concentrations estimated as well.

[3] Where data is “J” qualified, the reported results are approximate values only.

Table 6 – PCB Data[4]

Sample Location	Sample Identification	Sample Date Range		Total PCB Mass[1] (picograms)	Total Air Volume through PUF Filter (liters)	Total PCB Concentration (picograms/liter)
		Start Date	End Date			
SITE 1	SITE 1 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	6,379,981 J	593,076	10.8
SITE 2	SITE 2 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	22,282,643 J	541,517	41.1
SITE 3	SITE 3 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	5,474,878 J	611,535	9.0
SITE 4	SITE 4 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	11,754,294 J	649,041	18.1
SITE 5	SITE 5 - COMPOSITE 4 (WET SEASON - OCT, NOV, DEC)	9/15/2020	12/15/2020	23,386,613 J	698,541	33.5

NOTES:

[1]Air dust composite samples collected using polyurethane foam (PUF) sorbent cartridges. PUF samples analyzed for PCB congeners by U.S. Environmental Protection Agency Method 1668C. Total PCB mass derived by summing all PCB congener analytical results; non-detect values were set to zero (0) for purposes of the total summation.

J = result is an estimate
PCB = polychlorinated biphenyl

Data validation for Tables 5 and 6 were conducted by SIM consultants, Farallon Consulting.

There are no "standards" for comparing the data in Tables 5 and 6. As such these data (including additional Phase II data) will be compared, on a relative basis, to Phase III data that will be collected at the Site, post installation of controls.

Tables 5 and 6 are also included in the attached Excel spreadsheet for ease of readability.

More granular dioxin/furan and PCB data (i.e., by individual species) collected during January – June 2021, in the latter half of the Phase II program are available and provided on the project website.

Finally, all of the results for metals sampling during all of the Phase II time periods are provided **Table 7**, in Excel format. A summary of this data, i.e., the average concentration for each metal, by quarter, is provided in **Table 7A** below. The table is organized to show the highest concentrations in the dry season. Although the table shows the metals, it also includes data for certain non-metals such as chlorine and bromine.

Table 7A – Summary of Metals Concentrations

Phase II	**All Sites**	**All Sites**	**All Sites**	**All Sites**
Sample Date	**6/17/20 - 9/15/20**	**9/29/20 - 1/19/21**	**1/20/21 - 4/26/21**	**4/26/21 - 6/15/21**
Units	**ug/m^3**	**ug/m^3**	**ug/m^3**	**ug/m^3**
Calcium	1.99727	0.23650	2.05440	2.53860
Iron	0.83308	0.94662	4.49880	5.61860
Silicon	0.59454	0.26828	2.05900	2.24580

[4] A picogram is a unit of mass equal to one trillionth of a gram (1 picogram = 0.000000000001 grams).

Aluminum	0.29797	0.10564	0.82374	1.09546
Sulfur	0.27287	0.17572	0.43150	0.62404
Potassium	0.16258	0.07460	0.27524	0.29522
Chlorine	0.14952	0.27232	0.66696	0.55448
Sodium	0.14216	0.10336	0.26410	0.33920
Zinc	0.10585	0.13804	0.58208	0.90932
Titanium	0.08267	0.01372	0.15280	0.15908
Magnesium	0.07088	0.04490	0.19630	0.24362
Tin	0.03270	0.01122	0.01710	0.02884
Manganese	0.02033	0.02102	0.07768	0.10680
Phosphorus	0.01953	0.01034	0.03912	0.05090
Copper	0.01935	0.02250	0.05854	0.07720
Lead	0.01908	0.01110	0.04622	0.08116
Barium	0.01600	0.01822	0.05808	0.06906
Zirconium	0.01345	0.00294	0.01602	0.01788
Strontium	0.01013	0.00228	0.02190	0.02220
Chromium	0.00497	0.00948	0.02372	0.02560
Nickel	0.00287	0.01140	0.01278	0.01626
Bromine	0.00245	0.00294	0.00582	0.00592
Arsenic	0.00220	0.00200	0.00486	0.00444
Vanadium	0.00202	0.00060	0.00472	0.00472
Selenium	0.00137	0.00036	0.00048	0.00074
Antimony	0.00127	0.00256	0.00562	0.00594
Lanthanum	0.00110	0.00272	0.00000	0.00150
Gallium	0.00100	0.00002	0.00144	0.00168
Molybdenum	0.00100	0.00278	0.00402	0.00516
Yttrium	0.00082	0.00014	0.00106	0.00114
Rubidium	0.00063	0.00026	0.00166	0.00140
Cobalt	0.00045	0.00972	0.00000	0.00000
Cadmium	0.00022	0.00024	0.00108	0.00226
Palladium	0.00012	0.00006	0.00010	0.00004
Silver	0.00008	0.00006	0.00026	0.00056
Germanium	0.00000	0.00020	0.00034	0.00040
Indium	0.00000	0.00000	0.00022	0.00012
Mercury	0.00000	0.00012	0.00004	0.00000

As previously noted, although none of the metals (and non-metals) above have standards similar to NAAQS, there is one exception and that is lead. The 3-month average lead standard is 0.15 ug/m^3, as previously noted. As can be seen in the Table 7A above, measured lead levels in each quarter for Phase II (i.e., approximately 3-month averages) were 0.01908, 0.0111, 0.04622, and 0.08116 ug/m^3 in the June-Sep, Sep-Jan, Jan-Apr, and Apr-Jun quarters, respectively. All of these values are substantially lower than the NAAQS.

NEXT STEPS – LESSONS LEARNED

There were some instrumentation issues in the beginning of the Phase II program and these were rectified as the campaign progressed. As always allowing for proper planning prior to the start of any ambient monitoring campaign will result in the highest possible data recovery, recognizing that long campaign inevitably have unforeseen circumstances which result in some data loss. Data loss during Phase II was modest and did not affect the overall data collection.

SIM is in process of installing dust control structures at their facility, including wind fences for both 601 and 701 facilities and a de-duster system for the scrap metal shredder located on 601. Once the dust control structures are installed, Phase III dust monitoring will commence. The Phase III dust study will replicate the Phase II dust study. The results of Phase II and Phase III results will be compared to understand the efficacy of the dust control measures.